**Program 21**

**AIM:** Write a program in Python to implement Bidirectional Associative Memory (BAM) network to store and test the given patterns.

**CODE:**

import NumPy as np

x1=np.array([[1,1,1,-1,1,-1,-1,1,-1,-1,1,-1]])

x2=np.array([[1,1,1,1,-1,1,1,-1,1,1,1,1]])

x3=np.array([[1,1,1,-1,1,-1,-1,1,-1,1,1,1]])

t1 = np.array([[-1],[1]])

t2 = np.array([[1],[1]])

w1=np.zeros((12,2),dtype=int)

w2=np.zeros((12,2),dtype=int)

w=np.zeros((12,2),dtype=int)

i=0

while(i!=12):

w1[i][0]=x1[0][i]\*t1[0][0]

w1[i][1]=x1[0][i]\*t1[1][0]

w2[i][0]=x2[0][i]\*t2[0][0]

w2[i][1]=x2[0][i]\*t2[1][0]

i=i+1

w=w1+w2

print('The Weight Matrix is:\n')

print(w)

Yin11=Yin12=Yin21=Yin22=Yin31=Yin32=0

y1=0

y2=0

i=0

while(i!=12):

    Yin11=Yin11+(x1[0][i]\*w[i][0])

    Yin12=Yin12+(x1[0][i]\*w[i][1])

    Yin21=Yin21+(x2[0][i]\*w[i][0])

    Yin22=Yin22+(x2[0][i]\*w[i][1])

    Yin31=Yin31+(x3[0][i]\*w[i][0])

    Yin32=Yin32+(x3[0][i]\*w[i][1])

i=i+1

if(Yin11>0):

    Yin11=1

else:

    Yin11=-1

if(Yin12>0):

    Yin12=1

else:

    Yin12=-1

if(Yin21>0):

    Yin21=1

else:

    Yin21=-1

if(Yin22>0):

    Yin22=1

else:

    Yin22=-1

if(Yin31>0):

    Yin31=1

else:

    Yin31=-1

if(Yin32>0):

    Yin32=1

else:

    Yin32=-1

if((Yin11==-1) and (Yin12==1)):

print('Pattern T is recognized for Y-Layer')

else:

print('Pattern T is not recognized for Y-Layer')

if((Yin21==1) and (Yin22==1)):

print('Pattern O is recognized for Y-Layer')

else:

print('Pattern O is not recognized for Y-Layer')

i=0

Xin1=np.zeros((12,1),dtype=int)

Xin2=np.zeros((12,1),dtype=int)

while(i!=12):

    Xin1[i][0]=Xin1[i][0]+((Yin11\*w[i][0])+(Yin12\*w[i][1]))

if(Xin1[i][0]>0):

Xin1[i][0]=1

else:

Xin1[i][0]=-1

    Xin2[i][0]=Xin2[i][0]+((Yin21\*w[i][0])+(Yin22\*w[i][1]))

if(Xin2[i][0]>0):

Xin2[i][0]=1

else:

Xin2[i][0]=-1

i=i+1

Xin1=Xin1.T

Xin2=Xin2.T

print('\n')

if((Xin1==x1).all()):

print('Pattern T is recognized for X-Layer')

else:

print('Pattern T is not recognized for X-Layer')

if((Xin2==x2).all()):

print('Pattern O is recognized for X-Layer')

else:

print('Pattern O is not recognized for X-Layer')

print('Testing of I \n Values for I are:', Yin31 ,'\t',Yin32)

**OUTPUT:**

